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nation became stipular sheaths after having been partially organized as leaf blade; and that *Liriodendron* differs from *Magnolia* only in possessing a greater power of adnation.

Notes on *SILPHIUM LACINIATUM*, L.—The Compass Plant.

BY THOMAS MEEHAN.

It is at once the strength and the weakness of science that it takes little on trust. One would suppose that, after the positive facts given by President Hill in his paper before the recent meeting of the American Association, there was no room for doubt that the edges of the leaves of *Silphium laciniatum* had an average bearing north. But I find men—excellent, acute observers—who doubt the facts. They say “We took the trouble to examine the plants on the spot, and found not the slightest trace of any such tendency; we want no better evidence than that of our own senses.”

As before suggested, it is an excellent habit to verify, for ourselves, the facts reported by others—there is far too little of this habit,—but when the observations conflict, it is safer to assume that both are right, and that there is something yet undiscovered which would harmonize the opposition, than that either one is wrong.

In this matter of the *Silphium* or “compass plant” I was able to find this missing link, and to see that both parties were right.

When I first saw the *Silphium*, to any great extent, in its natural localities, there was not the slightest indication of this northern tendency. It was a great surprise, as a limited knowledge of it before had taught the reverse. I determined to watch a plant carefully on my own grounds the next year. The result was just as described by President Hill. There was the unmistakable northern tendency in the leaves when they first came up, and until they were large and heavy, when winds and rains bore them in different directions, and they evidently had not the power of regaining the points lost. This often took place by their own weight alone, especially in luxuriant specimens. Mr. Hill says it was in June when he saw them on the prairies, all bearing north; when I saw them, and not doing so, it was early in September, and then no doubt the mechanical causes I have referred to, had been in operation.

The plant I have had in my garden now for some years affords much interest in many respects. I learned an useful lesson from it this year, in reference to the relative rates of growth in the different parts of the inflorescence. Noticing that there appeared to be no growth in the disk florets in the day, I determined to note accurately one morning during the last week in August, exactly when growth did commence. The ray flowers close over the disk during night, and at 4 A. M., with day just dawning in the east, I found the ray petals just commencing to open back. In the disk there are about fifteen coils of florets in the spiral. There appeared no motion until 4.40, although no doubt growth commenced at 4, when the ray petals were in motion, but too slow to be perceptible. At 4.40, however, the five outer circles were evidently slightly elevated above the others in the disk. Then follows the following record in my diary:

4.45. The five divisions of the corolla split open.

4.50. Corollas grown three thirty-seconds of an inch.

4.55. Divisions of corolla fully expanded.

5. Florets two-eighths above the rest of the disk. It might be well to say here that there was no growth in any this morning but in the five outside rows we are speaking of.

5.5, 5.10. No apparent change except that some which were not so perfectly opened as the others seemed to become so.

5.15. Pistil and mass of stamens slightly elevate above the level of the corolla.

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5.20. Corollas now about five-sixteenths of an inch above the others in disk. Pistils and stamens about two lines above the corollas. Long yellow ray petals half open, with no appearance of pollen on their pistils.

From this time forward there was no further growth of the corolla, so that this portion of the daily labor was accomplished in about three quarters of an hour.

5.25. Pistils and stamens beyond the corolla . . . 1-32d inch.

5.30. " " " . . . 1-16th "

5.35. " " " . . . $\frac{1}{8}$ th "

5.40. " " " . . . $\frac{1}{8}$ th "

5.45, 5.50. No change.

5.55. Pistils begin to project beyond the stamens. The first insect, a sand wasp appears. He inserts his proboscis down between the clavate pistil and the stamens, carrying away the pollen, which is all over his head.

6. 6.5. Pistils one line; stamens no longer lengthen.

6.10. Anthers are falling away from the pistils, which are two lines beyond.

6.15. No change.

6.20. The ray petals now fully open, that is horizontal.

No change was noticed after this, except the free visits of sand wasps; none of these, however, carried any pollen to the pistils in the ray florets.

About 9 o'clock (there had not been the slightest indications of any growth since 6.20) heavier insects began to arrive, and then the slightest touch broke off the florets, which fell on the ray pistils which happened to be below them, and in this way they were fertilized. These pistils died very soon afterwards. Those pistils on the upper side (the flower leaning a little) were quite fresh the next morning, awaiting some chance to be fertilized, insects, evidently, not performing that office.

We here see that there were three phases of growth, with a slight rest between each, the pistil taking the most time, then the stamens, and the corolla the least; but the whole growth of the day included within two hours.

I have used the term pistil for the clavate process which occupies the place of the true organ in the ray florets. Of course only the ray floret of *Silphium* have perfect pistils. This clavate false pistil, or ovary, has hitherto been supposed to be a necessary production for the fertilization of the plant. It was supposed to push out the pollen, which was thereby scattered to the ray florets about it. But these observations show that this is probably an error, and that fertilization is chiefly carried on by the easy falling away of the mass of stamens, as I have shown in a paper on *Euphorbia Jacquinæflora*, in last years *Proceedings*, is the case with that species.

I am anxious to call particular attention to the different ratios of growth in connection with the appearance of different floral organs in this plant, because I think I see traces of a general law in plants that there are vibrations or varying intensities during each season's growth, and that the production of various organs depends on degrees of these vibrations.

Observations on some Fishes new to the American Fauna, found at Newport, R. I. By Samuel Powell.

BY E. D. COPE.

A number of interesting additions to the ichthyological fauna of the United States having been sent to the Museum of the Academy of Natural Sciences by our fellow-member Samuel Powell, I place them on record for the convenience of ichthyologists. Several of the species, it will be observed, were new to science at the time they were received; some of these have been described by Prof. Gill. Most of these are of West Indian affinity, some being simply well known species of that region, which have wandered, as has been suggested by Gill, along the Gulf Stream, and turned aside on the southern coast of the New England States.

[Oct.